A PROGRAM TO EXCHANGE ERDAS AND EPPL7 DATA FILES

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ABSTRACT

This report is the documentation and user manual for a FORTRAN-77 computer program to convert geographic information system (GIS) files and satellite data between ERDAS image analysis system and EPPL7 GIS file formats. This program expands the data-capture ability of the EPPL7 GIS and allows users to take advantage of the analytical techniques of both systems when using an IBM PC-AT or compatible computer equipped with an Enhanced or Professional Graphics Adapter and appropriate ERDAS hardware and software.

Hardware/Software Requirements.

IBM PC/XT/AT or compatible computer
256-Kilobytes memory
monochrome or color display adapter
two floppy-disk drives or combination of a hard and floppy disk drive
PC/MS-DOS 3.10 or later

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INTRODUCTION

This utility program converts data files between the ERDAS and EPPL7 geographic information systems (GIS). The particular advantages of both cell-based systems can be fully exploited with this package. The program is menu-driven, allowing the user to easily step through the conversion process. Data packed in 4- and 8-bit ERDAS formats are currently supported, as well as files with up to 10,000 columns of data in each row. (Due to their incompatible nature, 16-bit ERDAS data files cannot be converted to EPPL7 format with this program.) In addition, single bands of a Landsat satellite image in the ERDAS system can be converted to an equivalent EPPL7 format. All color and legend information associated with a data file is transfered between the two systems. Written in Microsoft Fortran-77, the program is easily adaptable to newer version of data files in either GIS.

The ERDAS and EPPL7 Systems

The ERDAS (Earth Resources Data Analysis System) package combines the processing of satellite imagery with the analytic tools of a geographic information system. This cell-based system commonly handles classified data with categories numbered from 0 to 255 (where 0 represents "offsite" or "background" areas). Software procedures allow the user to rectify a satellite image to a map base, collect "spectral signatures" of land cover identified on the image, create a classified GIS map of the satellite image, overlay additional GIS files for identification of spatially-congruent activities (e.g. forested land cover on sandy soils with 5 to 10 percent slopes that are owned by the Federal Government), select smaller "windows" from a larger file for subsequent analysis, change the cell-size (resolution) of the data to match other GIS maps, and print the files as maps for analysis or publication. Although the software runs on a standard IBM PC-AT computer, additional hardware of a specialized nature, including a math coprocessor, high-resolution monitor, image-processing board, nine-track magnetic tape drive, and color printer, is also necessary. (Versions of the ERDAS software also exist for DEC VAX, Prime, and Data General computers, which we currently do not support with this conversion program.)

The EPPL7 (Environmental Planning and Programming Language, Version 7) software provides a complete set of procedures for a cell-based GIS. The package requires only a "vanilla" IBM PC (two-floppy disk drives, color display adapter, and 256 kilobytes of memory). Although the standard color display adapter (CGA) with four colors is supported, an enhanced color adapter (EGA) with 16 simultaneous colors out of 64 or a professional color adapter (PGA) with 256 simultaneous colors out of 4096 is recommended. Categories in an EPPL7 file are numbered from 0 to 255. Separate text files contain the legend or color sequence (in intensity of red, blue, and green colors) for each class of a map.

SOFTWARE INSTALLATION

The distribution disk for the conversion program contains a single program, EPPERD.EXE. Although the program will execute from a floppy-disk, the software operates faster if installed on a hard disk. We recommend installation of the EPPERD program on the ERDAS computer, since that system requires a hard disk for its operation.

> *We grant permission for additional copies of this program to reside on each computer that contains the EPPL7 package, if those machines are separate from the computer that contain the ERDAS software.*

If a floppy disk must be used, install the program on a disk that has been formatted to contain a copy of the operating system (using the DOS FORMAT command with the /S option). Because of the potentially large size of many GIS or Landsat files, we do not recommend this type of operation, unless high-density (720 Kb, 1.2 Mb, or 1.4 Mb) floppy disks are available.

Installation on the ERDAS computer

With the current implementation of the ERDAS software (Revision 7.2), the EPPERD program should be installed in the same subdirectory as the ERDAS programs. On our IBM AT, that subdirectory is C:\ERDAS72\PROGS. To copy the EPPERD program to this subdirectory, use the DOS 'COPY' command as follows:

```
COPY A:EPPERD.EXE C:\ERDAS72\PROGS /V
```

The EPPERD program can be executed from the ERDAS menu system by typing its name in response to the 'ERD>' prompt.

Installation on the EPPL7 computer

Please ignore the following if the EPPL7 and ERDAS computers are the same.

The EPPERD program should be installed on the same subdirectory as the EPPL7 program. On our particular IBM AT, this subdirectory is C:\EPPL7. To copy the EPPERD program to this subdirectory, use the DOS 'COPY' command as follows:

```
COPY A:EPPERD.EXE C:\EPPL7 /V
```

Substitute your particular subdirectory name for the C:\EPPL7 used in this example. The EPPERD program can now be executed outside the EPPL7 program in response to the DOS prompt.

USING THE CONVERSION PROGRAM

Operation of the EPPERD conversion program is simple. In the examples that follow, **Bold** statements represent messages or requests presented by the program, and *reply* are responses provided by the user. The ERDAS GIS file, SOILS.GIS, is used in this demonstration. That file uses 13 categories (including the offsite category) to map soils of the Mobile Bay area by their textural class:

TABLE 1

CATEGORIES IN THE ERDAS 'SOILS' DEMONSTRATION FILE (LEVEL 0 IS THE OFFSITE CATEGORY)

Level	Legend
1	Gravelly-Loamy
2	Fine Sandy-Laomy
3	Coarse Sandy-Loamy
4	Coarse Loamy
5	Clayey
6	Clayey-Mixed
7	Loamy
8	Fine Loamy
9	Silt-Loamy
10	Silt-Sandy
11	Sandy
12	Mobile Bay & Gulf of Mexico

The 'SOILS.GIS' file is part of the standard ERDAS installation package and not included with the EPPERD program. In this documentation, we also refer to a Landsat image of the Mobile Bay area, MOBBAY.LAN, which is included with the ERDAS system, as an example of a satellite image that might be used with a GIS.

To help the user understand the conversion process, the following description of program options has been divided by task. We will begin by describing how to start the program and receive the main menu. After that, each menu option will be discussed separately. The conversion of ERDAS GIS and Landsat image files to the EPPL7 will be discussed first, followed by the conversion of data files from EPPL7 to the ERDAS system. *Although we use the same 'SOILS' file to demonstrate both options, the user will rarely need to convert a file from one system to another and then back again.*

STARTING THE PROGRAM

The conversion utility is started by simply typing:

epperd

The conversion program can be called from the ERDAS menu driver as long as the program resides in the standard ERDAS program subdirectory (\ERDAS72\PROGS) or in a subdirectory assigned by the DOS PATH command. The user needs only to type EPPERD in response to the ERD> prompt. When used on a computer with EPPL7, the conversion program executes *outside* the EPPL7 package.

When the EPPERD program is loaded, the following message appears:

```
**********************************************************
**                                                      **
**  EPPL7/ERDAS Data File Conversion Program            **
**                                                      **
**                                                      **
**                    Copyright (C)                     **
**                Department of Geography               **
**                University of Minnesota               **
**                - Version 2.33  July, 1987 -          **
**                                                      **
**********************************************************
```

Following this message, the program will display its standard menu and request a conversion option:

Conversion Type?

1) From ERDAS to EPPL7
2) From EPPL7 to ERDAS
3) Exit Program

Enter a 1, 2, or 3

The user must respond with a *digit* to select the desired conversion option. If a character other than a 1, 2, or 3 is entered, the program will display an error message for an incorrect option and display the menu a second time. After each file conversion, the program will once again display this menu.

OPTION 1 -- CONVERSION TO EPPL7

Option 1 on the main menu selects the conversion of an ERDAS GIS or Landsat file to a comparable EPPL7 file:

Enter a 1, 2, or 3
1

The program will now prompt the user for names of the data files to convert:

Enter a file name for an ERDAS [.GIS] file.
soils

Enter a file name for an EPPL7 [.EPP] file.
soils

The two filenames do not necessarily have to be the same, although similarity can help someone trying to trace the origin of a file. The user also does not need to enter an extension for each file. The program automatically assumes a '.GIS' extension for an ERDAS GIS file and a '.EPP' extension for an EPPL7 file. If you wish to convert a single band of a satellite image on the ERDAS system, you must enter *both* the file name and the '.LAN' file extension (e.g. mobbay.lan) for the ERDAS file.

If either file cannot be found, the program will request a different filename from the user. Make sure that the proper disk drive is specified for each file. (You do not need to enter the disk drive letter or subdirectory designation if they are the same as the default drive specified in the DOS prompt.)

After the files have been located, the program will read the header record of the ERDAS file to obtain the number of lines and columns, packing format, and the number of bands in the data file. If more than one band is present in the file (i.e. the ERDAS file represents a Landsat image), the program will request a number for the band to convert:

This ERDAS file contains 4 bands.
Which Band do you want to Copy?

The user should select a band for the conversion. For example:

Which Band do you want to Copy?
3

will convert the third image band (out of four). When a Landsat file is converted to an EPPL7 GIS file, each class in the GIS file represents an intensity value from 0 to 127.

The number of rows and columns in the file will be displayed, followed by the current line being converted by the program. For the ERDAS 'SOILS' demonstration file, this message will read:

ERDAS File has 500 rows and 417 columns

... Copying ERDAS file to EPPL7 file
... Processing Row 1

The '... Processing Row' message is updated with each new row that is converted to EPPL7 format. It is not uncommon for data files to take several minutes to be converted. All ERDAS files converted to the EPPL7 will have Class 0 declared as the "offsite" or "background" (the normal value on the ERDAS system).

When the conversion of the data file is complete, the display will read:

ERDAS File has 500 rows and 417 columns

... Copying ERDAS file to EPPL7 file
... Processing Row 500
... Done!

The user now has the opportunity to convert the ERDAS Trailer file ('.TRL') to its equivalent EPPL7 Color Table ('.CLR') and Legend ('.LEG') files:

Do you want to convert the ERDAS Trailer [.TRL] file? [Y or N]

You should select this option only if an ERDAS GIS file was converted by this program; ERDAS Landsat files do not have a Trailer file. The program automatically assumes that the Trailer file is to be created using the same file name as the ERDAS data file (e.g. 'SOILS.TRL' for the 'SOILS.GIS' file). The EPPL7 Color Table and Legend files are assumed to have the same name as the '.EPP' file, except for a change in extensions.

If the user responds with 'yes' (Y), the program creates the EPPL7 files:

Do you want to convert the ERDAS Trailer [.TRL] file? [Y or N]
y

... Reading Histogram
... Creating LEGEND file
... Creating COLOR TABLE file

After the successful conversion of the ERDAS Trailer File, the program returns to the main menu. If the user responds to the request with 'no' (N), the program goes immediately back to the main menu.

OPTION 2 -- CONVERSION TO ERDAS

Option 2 on the main menu selects the conversion of an EPPL7 GIS file to the ERDAS system:

Enter a 1, 2, or 3
2

The program prompts the user for the names of the data files to convert:

Enter a file name for an EPPL7 [.EPP] file.
soils

Enter a file name for an ERDAS [.GIS] file.
soils

The two filenames do not necessarily have to be the same, although similarity can help someone trying to trace the origin of a file. The user also does not need to enter an extension for each file. The program automatically assumes a '.EPP' extension for an EPPL7 file and a '.GIS' extension for an ERDAS GIS file. If you wish to convert an EPPL7 file into a satellite image file with one band on the ERDAS system, you must enter *both* the file name and the '.LAN' file extension (e.g. mobbay.lan) for the ERDAS file. (Class values in the EPPL7 file must also represent intensity values between 0 and 127 to work properly as a Landsat file.)

If either file cannot be found, the program will request a different filename from the user. Make sure that the proper disk drive is specified for each file. (You do not need to enter the disk drive letter or subdirectory designation if it is the same as the default drive specified in the DOS prompt.)

After the files have been located, the program will read the header record of the EPPL7 file to obtain the number of lines and columns. These values are displayed for the users benefit. For the 'SOILS' demonstration file, this message will read:

EPPL7 File has 500 rows and 417 columns

To properly convert an EPPL7 file to the ERDAS system, the EPPERD program must know the value for the highest category in the GIS file. This value controls the form of data packing used in the ERDAS file, plus is stored as part of the ERDAS header record. The user must enter the value in response to the following question:

What is the HIGHEST CLASS number in the file? [0..255]

This number is usually determined using the 'COUNT' command of the EPPL7

program. For the 'SOILS' demonstration file, the highest class number is 12 (see the list of categories in Table 1):

What is the HIGHEST CLASS number in the file? [0..255]
12

The program will now create an ERDAS file from an EPPL7 file. During this conversion, the user will be kept informed of the progress:

... Copying EPPL7 file to ERDAS file
... Processing Row 1

The '... Processing Row' message will be updated with each new row. It is not uncommon for data files to take several minutes to be converted. When the conversion of the data file is complete, the display will read:

ERDAS File has 500 rows and 417 columns

... Copying EPPL7 file to ERDAS file
... Processing Row 500
... Done!

After this conversion, the user will have the opportunity to create an ERDAS Trailer file ('.TRL') from its equivalent EPPL7 Color Table ('.CLR') and Legend ('.LEG') files:

Do you want to build the ERDAS Trailer [.TRL] file? [Y or N]

If the user responds with 'yes' (Y), the program will create the ERDAS Trailer file. The program assumes that the Trailer file should be created using the same file name as the ERDAS data file (e.g. 'SOILS.TRL' for the 'SOILS.GIS'). The EPPL7 Color Table and Legend files are assumed to have the same name as the '.EPP' data file.

Do you want to build the ERDAS Trailer [.TRL] file? [Y or N]
y

... Writing COLOR TABLE to the Trailer File
... Writing HISTOGRAM to the Trailer File
... Writing LEGEND to the Trailer File

Following the successful creation of an ERDAS Trailer file, the program returns to the main menu. If the user responds to the request with 'no' (N), the program goes immediately back to the main menu.

An ERDAS Trailer file can still be created without the existence of either or both of the EPPL7 Color Table and Legend files. (Not all EPPL7 files are required to have legend or color information.) If either file does not exist, the ERDAS Trailer file is created using fabricated values (all black colors or blank legend names). A frequency count of class values is still written to the Trailer file, regardless of the existence of either EPPL7 file. For example, if neither file exists, the following messages will be displayed:

... Writing COLOR TABLE to the Trailer File

***** Oops! Can't find Eppl7 Color File *****
... Writing "Dummy" Version to the Trailer File
... Writing HISTOGRAM to the Trailer File
... Writing LEGEND to the Trailer File

***** Oops! Can't find Eppl7 Legend File *****
... Writing "Dummy" Version to the Trailer File

A missing file message may only indicate that the Color Table or Legend file exist on a different floppy disk or subdirectory than the GIS files. If this is the case, the currrent version of the EPPERD program requires the user to rerun the entire conversion process after making the color table or legend files available. The EPPERD program does not have the option to convert or create just the trailer file.

LEAVING THE PROGRAM

Option 3 of the main menu is used to exit the program:

Conversion Type?

1) From ERDAS to EPPL7
2) From EPPL7 to ERDAS
3) Exit Program

Enter a 1, 2, or 3
3

The program returns the user to the default DOS prompt (e.g. C:>)

ERROR MESSAGES

This EPPERD program has been designed to catch errors without forcing a premature end of the program. For user responses (e.g. conversion option, file names, band numbers, yes/no questions, etc.), an incorrect response usually leads to an error message, followed by a repeat of the question. Trouble encountered during the processing of files (e.g. read errors, incorrect data formats, etc.) usually results in cancellation of the requested conversion.

Problems with the EPPERD file conversion program should be reported to the contact persons listed below. Please include a printed copy of the screen display, plus a description of your data files and equipment, with your correspondence to help us diagnose the problem.

REFERENCES

The following persons may be contacted for information on the program and to report specific problems with the software:

Dr. Dwight Brown or
Dr. Philip Gersmehl
Department of Geography
University of Minnesota--Twin Cities
414 Social Science Building
267-19th Avenue South
Minneapolis, Minnesota 55455

Please refer to *Special Report No. 16* in your correspondence.

Disclaimer. The authors of this program, and the names of individuals listed as contact persons at the University of Minnesota, are not responsible for the consequences or damages that may result from an incorrect or unsupervised use of this program, including the inadvertent modification or loss of data or the loss of entire files. We are also not responsible for any misuse or misinterpretation of the data used with this program. We cannot guarantee the program or documentation to be entirely error-free. The program was tested on an IBM AT with 512 kilobytes of memory, IBM Monochrome and Professional Graphics Displays, and no memory-resident programs (such as SideKick, etc.); we cannot guarantee that your particular hardware/software configuration will not interfere with the proper operation of the software. The current version of the EPPL/ERDAS conversion program described in this document does not provide for backup copies or protection of existing files that are overwritten by an operation of this program. **The user of this program is expected to provide the necessary file protection and backup of their data.**